

## Knowledge, attitude, practice and perception of sunscreen among Saudi population

### To Cite:

Alshayeb Z, Alsaadoun D, Alyaseen H, Albadan M, Alyaseen S, Alhussain B. Knowledge, attitude, practice and perception of sunscreen among Saudi population. *Medical Science* 2022; 26:ms411e2386. doi: <https://doi.org/10.54905/disssi/v26i128/ms411e2386>

### Authors' Affiliation:

<sup>1</sup>Medical Intern, Collage of medicine, King Faisal University, Al-Ahsa, Saudi Arabia; Email: Zahraa97K@gmail.com

<sup>2</sup>Assistant professor, Dermatology department, King Faisal University, Al-Ahsa, Saudi Arabia; Email: Dr\_dalal\_s@hotmail.com

<sup>3</sup>Medical Intern, Collage of medicine, Istanbul university cerrahpaşa tıp fakültesi, Istanbul, Turkey; Email: H.y.Alyaseen@hotmail.com

<sup>4</sup>Medical Intern, Collage of medicine, Istanbul university cerrahpaşa tıp fakültesi, Istanbul, Turkey; Email: M.ali.36@hotmail.com

<sup>5</sup>5th year medical student, Collage of medicine, King Faisal University, Al-Ahsa, Saudi Arabia; Email: Sara\_alayaseen@outlook.sa

<sup>6</sup>Medical Intern, Collage of medicine, Medical university of Warsaw, Warsaw, Poland; Email: Dr.bayanabb@hotmail.com

### Peer-Review History

Received: 05 July 2022

Reviewed & Revised: 14/July/2022 to 05/October/2022

Accepted: 09 October 2022

Published: 15 October 2022

### Peer-review Method

External peer-review was done through double-blind method.

URL: <https://www.discoveryjournals.org/medicallscience>



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**Zahraa Alshayeb<sup>1</sup>, Dalal Alsaadoun<sup>2</sup>, Hawra Alyaseen<sup>3</sup>, Maram Albadan<sup>4</sup>, Sarah Alyaseen<sup>5</sup>, Bayan Alhussain<sup>6</sup>**

### ABSTRACT

**Introduction:** Direct exposure to solar radiation frequently can drastically increase the probabilities of skin cancer. However, this may be avoided via way of means of sunscreen use which is considered as an essential safety measure in opposition to the harmful effects of the Solar's ultraviolet rays on our skin. **Aim:** In this study, the awareness of sunscreen utilization was evaluated amongst Saudi population in conjunction with other sun-protective attitudes and practices. **Materials and methods:** For the purpose of this study, a structured questionnaire was designed with regards to knowledge, attitude, practice, and perception of sunscreen amongst Saudi population. The study was conducted between June to November 2021. The population sample was 3235 participants aged 18 years and above. **Results:** The findings of the study confirmed that the subsequent categories have a higher knowledge regarding sun protective measures and the significance of sunscreen utilization; the categories include younger individuals, females, singles, indoor workers, and individuals with higher education. **Conclusion:** In the current study, approximately half of the participants have accurate knowledge in line with sun protective measures and the significance of sunscreen use. The study has additionally recognized several areas of inadequate use of sunscreen. To overcome this unfortunate case, this study recommends sponsoring intensive campaigns to raise awareness across all community spectrums. These campaigns may even assist correct common misconceptions concerning sunscreen consisting of the pointless use whilst cloudy and negative affection to vitamin D level in the body. As a result, increasing the perception of effective sunscreen use in our country is probably needed.

**Keywords:** Sunscreen, Sun protective, Ultraviolet (UV), sun protection factor (SPF), protection grade of ultraviolet A (PA) values

### 1. INTRODUCTION

Ultraviolet (UV) irradiation from sunlight is a well-known carcinogen (Matsumura and Ananthaswamy, 2004). It has many negative short-term and long-term effects on the skin including sunburn, freckling, discoloration, photoaging, phototoxic or photoallergic reactions, post inflammatory

hyperpigmentation, and photosensitivity diseases such as solar urticaria, and chronic actinic dermatitis. All the aforementioned points are common indications for sunscreen use which also help in preventing them (Abraham and Kaimal, 2011; Alshaalan et al., 2022). Sunscreen is defined as a substance that used to reduce the intensity of penetrating the sun's ultraviolet (UV) rays to the skin and damaging vulnerable skin cells. It has many forms including creams, lotions, and sprays. Sunscreen is classified by FDA into organic and inorganic sunscreens which replace the formerly used terms "chemical" and "physical", respectively. Chemical sunscreens absorb the UV lights while physical sunscreens reflect them (Abraham and Kaimal, 2011). Sunscreens are manufactured with a wide range of sun protection factors (SPFs) which indicates the product's level of sunburn protection. All sunscreens are tested to measure the amount of UV radiation exposure required to cause sunburn when using a sunscreen versus the amount of UV exposure required causing sunburn when not using a sunscreen. Then, the product is labeled with the corresponding SPF value as higher SPF values (up to 50) provide greater sunburn protection. The SPF values are determined from a test that measures protection against sunburn from UVB radiation, so the SPF values only indicate the UVB protection of the sunscreen.

Numerous studies were undertaken globally to assess public perception of sunscreen use and other sun protection behaviors. In the United States (US), sunscreen was the third sun protection behavior (31.5%). It is preceded by staying in the shade (37.1%) (Holman et al., 2018). Similarly, Jordanian study indicates a lack of sunscreen use and knowledge. As females are using sunscreens more than males, 73.1% and 25.3% respectively (Al-Qarqaz et al., 2019). In Saudi Arabia, a study was done on the general population. It revealed only 8.3% use sunscreen preparation. Female, higher social class, higher educational level, being married, and type four skins were the majority of sunscreen users (Al Robaee, 2010). On the other hand, a study conducted among university students shows a high rate of sunscreen use as it accounts for approximately 50%. Sunburn prevention was the most reported cause to use the sunscreen while time-consuming was the most reported cause for not using it (Al Jasser et al., 2020).

The main objective of this study is to assess participant's perception, commitment to instructions, and factors associated with sunscreen use and other protective behaviors among Saudi population. Excessive unprotected sun exposure plays an important role in development of skin cancer and other skin damages such as burning, tanning, hyperpigmentation, and skin aging due to high cumulative levels of ultraviolet (UV) radiation. Therefore, sun protection methods including sunscreen are critical for preventing diseases related to sun exposure.

## 2. MATERIALS AND METHODS

To determine how Saudi adults over the age of 18 in the eastern, central, western, southern, and northern regions perceive the use of sunscreen, a cross-sectional survey was conducted. Between June and November 2021, a doctor and a group of medical students did the study. Almoosa Academic Affairs (ASH), Al-Ahsa, Saudi Arabia, authorized the study proposal (approval number ARC-21.08.04). The survey was created with Google Forms and distributed via a link on social media throughout the Kingdom of Saudi Arabia (Twitter, WhatsApp, and Telegram channel). Given that the majority of the study's participants were Arab, we translated the English version of the questionnaire into Arabic, had it evaluated by bilingual researchers many times, and then had 10 randomly selected participants assess its readability and completion time. Each participant was given the opportunity to give their informed permission before beginning the questionnaire after being told of the study's goals. Those who refused to provide their permission for their data to be used or to participate were not included. 3235 people in all were included in the research. Several questions regarding Saudi citizens' knowledge, attitudes, practices, and perceptions of sunscreen were included in a structured questionnaire. There were four key sections to the questionnaire. The personal and demographic characteristics make up the first section. The second section was intended to test students' understanding of sunscreen and sun exposure. The third section was meant to evaluate how participants believe about sun protection methods. The intent of the fourth section was to evaluate how people perceived sun protection.

### Data analysis

Data were revised, coded, and then submitted to statistical software IBM SPSS version 22 after collection (SPSS, Inc. Chicago, IL). Two-tailed tests were used for all statistical analysis. P-value 0.05 was considered statistically significant. For knowledge questions, each right response was worth one point, and the sum of the discrete scores for all the questions was computed. Participants who received less than 60% of the overall score were deemed to have bad knowledge, while those who received 60% or more of the entire score were deemed to have high knowledge. All variables, including the demographic information, family history, and kind of work performed by participants, undergone descriptive analysis based on frequency and percent distribution. Additionally, data on the participants' attitudes, perceptions, and knowledge about sun protection strategies were tallied. The distribution of participants' knowledge of sunscreens in relation to their bio-demographic information and other relevant characteristics was

evaluated using cross tabulation. On the other hand, the exact probability test for small frequency distributions and the Pearson chi-square test were utilized to test the relations.

### 3. RESULTS

The study questionnaire was completed by 3232 Saudi participants who met the inclusion criteria. The mean age of the participants was  $24.8 \pm 12.6$  years old, with a range of ages from 18 to over 45 years. There were 2639 (81.7%) participants were females. A total of 1994 (61.7%) were single and 2029 (64.7%) had university level of education while 1008 (31.2%) had high school educational level. As for monthly income, 1869 (57.8%) had monthly income below 2000 Saudi riyal (SAR), 440 (13.6%) had monthly income between 2000-5000 SR while 100 (3.1%) had monthly income exceeding 2000 SR. With regard to skin type, 294 (9.1%) had skin type I, 1271 (39.3%) had skin type II, 1126 (34.8%) had skin type III while 471 (14.6%) had skin type IV. Regarding occupation nature, 1428 (44.2%) had indoor jobs, only 320 (9.9%) had outdoor jobs while 1484 (45.9%) had not job. Only 36 (1.1%) had family history of skin cancer (table 1).

**Table 1** Bio-demographic data of Study participants, Saudi Arabia

Bio-demographic data	No	%
Age in years		
18-25	1976	61.1%
26-35	537	16.6%
36-45	436	13.5%
> 45	283	8.8%
Gender		
Male	593	18.3%
Female	2639	81.7%
Marital status		
Single	1994	61.7%
Married	1238	38.3%
Education		
Secondary / below	132	4.1%
High school	1008	31.2%
University / above	2092	64.7%
Monthly income		
< 2000 SR	1869	57.8%
2000-5000 SR	440	13.6%
5001-10000 SR	427	13.2%
10001-20000 SR	396	12.3%
> 20000 SR	100	3.1%
Skin type		
I	294	9.1%
II	1271	39.3%
III	1126	34.8%
IV	471	14.6%
V	66	2.0%
VI	4	.1%
Occupation nature		
Not employed	1484	45.9%
Indoor	1428	44.2%
Outdoor	320	9.9%
Family history of Skin Cancer		
Yes	36	1.1%
No	2901	89.8%
Don't know	295	9.1%

Table 2 shows the Knowledge regarding sunscreens and its benefits among the Saudi population. Exact of 89.4% of the participants think that sun exposure could cause skin hyperpigmentation, 87.8% think that men and women must be protected

against sun exposure, and 82.8% of the participants agreed that sun exposure could cause sunburn. Also, 75.9% think that the period of exposure to sunlight that causes the most harm is between 10:00 a.m. and 2:00 p.m., 69% think that sun exposure could cause skin aging. A total of 58.3% think that tanning beds have harmful consequences. While 56.3% think that sun exposure could cause skin cancer. In regards to sunscreens, 40.5% think that Sunscreen products are not necessary on cloudy days, and 38.8% think that Sunscreen products are protective. Exact of 39% know the meaning of protection grade of ultraviolet A (PA) values of Sunscreen Products and 38.9% know the meaning of sun protection factor (SPF)".

**Table 2** Knowledge regarding sunscreens and its benefits among Saudi population

Knowledge items	No	%
I think that sun exposure could cause sunburn.	Agree	2675 82.8%
	Neutral	446 13.8%
	Disagree	111 3.4%
I think that sun exposure could cause skin cancer.	Agree	1820 56.3%
	Neutral	1029 31.8%
	Disagree	383 11.9%
I think that sun exposure could cause skin ageing.	Agree	2231 69.0%
	Neutral	677 20.9%
	Disagree	324 10.0%
I think that sun exposure could cause skin hyperpigmentation.	Agree	2888 89.4%
	Neutral	239 7.4%
	Disagree	105 3.2%
I think that tanning beds have harmful consequences.	Agree	1884 58.3%
	Neutral	1132 35.0%
	Disagree	216 6.7%
I think that the period of exposure to sunlight that causes the most harm is between 10:00 a.m. and 2:00 p.m."	Agree	2452 75.9%
	Neutral	506 15.7%
	Disagree	274 8.5%
I think that sun exposure is more harmful during childhood compared with adulthood"	Agree	893 27.6%
	Neutral	1384 42.8%
	Disagree	955 29.5%
I think that men and women must be protected against sun exposure"	Agree	2837 87.8%
	Neutral	304 9.4%
	Disagree	91 2.8%
I think that Sunscreen products are protective	Agree	1254 38.8%
	Neutral	1431 44.3%
	Disagree	547 16.9%
I think that Sunscreen products are harmful to the skin in various ways	Agree	289 8.9%
	Neutral	1158 35.8%
	Disagree	1785 55.2%
I think that Sunscreen products are not harmful to the vitamin D levels in the body	Agree	371 11.5%
	Neutral	1385 42.9%
	Disagree	1476 45.7%
I believe that Sunscreen products are not necessary on cloudy days.	Agree	1310 40.5%
	Neutral	810 25.1%
	Disagree	1112 34.4%
I think that face cover (i.e., hijab) is enough to replace Sunscreen products.	Agree	811 25.1%
	Neutral	732 22.6%
	Disagree	1689 52.3%
I know the meaning of sun protection factor (SPF)"	Yes	1258 38.9%
	No	1974 61.1%
I know the meaning protection grade of ultraviolet A (PA) values of Sunscreen Products	Yes	1260 39.0%
	No	1972 61.0%

Table 3 shows the study participants' attitude toward measures of sun protection in Saudi Arabia. Exact of 1204 (37.3%) participants feel that protecting their skin from the sun is difficult, while 1907 (59%) worried about damage from sun exposure, and

1874 (58%) think that the harmful consequences of sun exposure are often avoided by personal protection. Table 4 shows the study participants practice & perception towards measures of sun protection in Saudi Arabia. The most commonly used behavior for skin protection among participants were seeking shade (78.5%), sunscreen (54.8%), wearing sunglasses (47.3%), and Wearing long-sleeve clothing, or Abayas (43.9%), and wearing a hat (22%). Just 37.7% participants sometimes use sunscreens while 18.9% use it regularly. Also, 74.8% reported that they avoid sun exposure between 10:00 a.m. and 2:00 p.m.

The most reported issue for choosing sunscreen product was SPF and PA values (31.8%), followed by Dermatologist suggestion (27%), Friends' suggestion (21.2%), and Pharmacist suggestion (17.8%). A total of 27.6% reported that they use SPF of 30-50 while 40.7% don't know which level they use. More than half of participants (58.3%) apply Sunscreen before going out by about less than 10 minutes. Also, 76.1% of the participants reported they apply sunscreen only once a day. The most reported body parts that participants usually cover by Sunscreen were face, neck and hands (50.5%), followed by face and hands (27.9%), and face only (21.5%). As for reasons of using sunscreen, 80.3% reported for to prevent development of dark skin spots, followed by to keep skin color light (67.5%), to prevent sunburns (66.7%), to prevent skin wrinkling (57.4%), to prevent skin cancer (43.6%), Doctor recommendation (20.5%) while the least reported was social media influence (10.2%).

**Table 3** Study participant's attitude towards toward measures of sun protection in Saudi Arabia

Attitude items	No	%
I feel that protecting my skin from the sun is difficult.		
Agree	1204	37.3%
Neutral	892	27.6%
Disagree	1136	35.1%
I am worried about damage from sun exposure.		
Agree	1907	59.0%
Neutral	756	23.4%
Disagree	569	17.6%
I think that the harmful consequences of sun exposure can be avoided by personal protection.		
Agree	1874	58.0%
Neutral	760	23.5%
Disagree	598	18.5%

**Table 4** Study participants practice & perception towards measures of sun protection in Saudi Arabia

Perception & practice items		No	%
Which of the following do you often use to protect your skin on sunny days	Seeking shade	2537	78.5%
	Sunscreen	1771	54.8%
	Wearing sunglasses	1530	47.3%
	Wearing long-sleeve clothing, or an Abaya	1420	43.9%
	Wearing a hat	712	22.0%
How often do you use Sunscreen?	Never	1403	43.4%
	Sometimes	1217	37.7%
	Regularly	612	18.9%
Do you avoid sun exposure between 10:00 a.m. and 2:00 p.m.?	Yes	2416	74.8%
	No	816	25.2%
For Sunscreen users: You choose your product according to	SPF and PA values	581	31.8%
	Dermatologist suggestion	494	27.0%
	Friends' suggestion	387	21.2%
	Pharmacist suggestion	326	17.8%
	Others	41	2.2%
What is the SPF of the sunscreen use?	< 10	81	4.4%
	10-29	142	7.8%

	30-50	504	27.6%
	> 50	357	19.5%
	Dont know	745	40.7%
When do you usually apply Sunscreen before going out?	Less than 10 min before going out	1066	58.3%
	10-20 min before going out	763	41.7%
When do you replay Sunscreen?	Every 2 hours	190	10.4%
	Every 3 hours	109	6.0%
	Every 4 hours	139	7.6%
	Only once a day	1391	76.1%
Which parts of your body do you usually cover by Sunscreen?	Face, neck, and hands	924	50.5%
	Face and hands	511	27.9%
	Face only	394	21.5%
What is your reason(s) for using sunscreen?	To prevent development of dark skin spots	1469	80.3%
	To keep my skin colour light	1235	67.5%
	To prevent sunburns	1220	66.7%
	To prevent skin wrinkling	1049	57.4%
	To prevent skin cancer	797	43.6%
	Doctor recommendation	375	20.5%
	Family or friend recommendation	258	14.1%
	Knowledge from internet	222	12.1%
	Social media influence	187	10.2%
	Others	27	1.5%

Figure 1 shows the overall knowledge level of study participants toward measures of sun protection in Saudi Arabia. A total of 1668 (51.6%) participants had a good knowledge level regarding measures of sun protection in Saudi Arabia while poor knowledge level was detected among 1564 (48.4%).

**Figure 1. Overall knowledge level of study participants toward measures of sun protection in Saudi Arabia.**

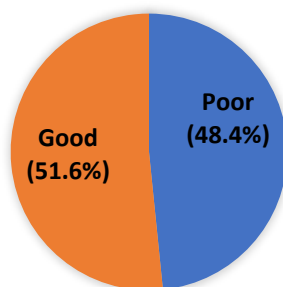


Table 5 shows the distribution of participants' knowledge regarding sun protection measures by their bio-demographic data. Good knowledge level was recorded among 54.1% of young aged participants (18-25 years) compared to 42.4% of those who aged more than 45 years with recorded statistical significance ( $P=.001$ ). Additionally, 56.9% of females had a good knowledge level versus 28.2% of males ( $P=.001$ ). Exact of 53.9% of single participants had good knowledge compared to 48% of married participants ( $P=.001$ ). Regarding education, 52.9% of university graduated participants had good knowledge in comparison to 43.2% of those with basic or secondary educational level ( $P=.049$ ). Furthermore, 54.1% of participants with skin type I had good knowledge versus 39.4% of those with skin type V ( $P=.035$ ). Besides, 50.1% of non-employed participants had good knowledge compared to 44.1% of

those who work at outdoor jobs ( $P=.001$ ). Also, 52.8% of participants with no family history of skin cancer had good knowledge versus 33.3% of others with family history ( $P=.001$ ). Good knowledge regarding sunscreens was detected among 81.4% of those who use it regularly versus 31.1% of non-users ( $P=.001$ ). Additionally, 86.3% of participants who use sunscreen every 2 hours had good knowledge versus 64.4% of users for once daily ( $P=.001$ ).

**Table 5** Distribution of participants' knowledge regarding sun protection measures by their bio-demographic data

Factors		Knowledge level				p-value
		Poor		Good		
		No	%	No	%	
Age in years	18-25	907	45.9%	1069	54.1%	.001*
	26-35	267	49.7%	270	50.3%	
	36-45	227	52.1%	209	47.9%	
	> 45	163	57.6%	120	42.4%	
Gender	Male	426	71.8%	167	28.2%	.001*
	Female	1138	43.1%	1501	56.9%	
Marital status	Single	920	46.1%	1074	53.9%	.001*
	Married	644	52.0%	594	48.0%	
Education	Secondary / below	75	56.8%	57	43.2%	.049*
	High school	503	49.9%	505	50.1%	
	University / above	986	47.1%	1106	52.9%	
Monthly income	< 2000 SR	884	47.3%	985	52.7%	.516
	2000-5000 SR	224	50.9%	216	49.1%	
	5001-10000 SR	218	51.1%	209	48.9%	
	10001-20000 SR	190	48.0%	206	52.0%	
	> 20000 SR	48	48.0%	52	52.0%	
Skin type	I	135	45.9%	159	54.1%	.035*
	II	590	46.4%	681	53.6%	
	III	544	48.3%	582	51.7%	
	IV	253	53.7%	218	46.3%	
	V	40	60.6%	26	39.4%	
	VI	2	50.0%	2	50.0%	
Occupation nature	Not employed	740	49.9%	744	50.1%	.001*
	Indoor	645	45.2%	783	54.8%	
	Outdoor	179	55.9%	141	44.1%	
Family history of Skin Cancer	Yes	24	66.7%	12	33.3%	.001*
	No	1368	47.2%	1533	52.8%	
	Dont know	172	58.3%	123	41.7%	
How often do you use Sunscreen?	Never	967	68.9%	436	31.1%	.001*
	Sometimes	483	39.7%	734	60.3%	
	Regularly	114	18.6%	498	81.4%	
When do you replay Sunscreen?	Every 2 hours	26	13.7%	164	86.3%	.001*
	Every 3 hours	36	33.0%	73	67.0%	
	Every 4 hours	40	28.8%	99	71.2%	
	Only once a day	495	35.6%	896	64.4%	

#### 4. DISCUSSION

Protection from UV light exposure is an important measure to avoid related skin hazards such as skin cancers, sunburns, hyperpigmentation, and skin aging. This can be achieved by many measures including seeking shade, sunglasses, hats, long clothes, and sunscreen use among others. This study is designed to assess the development of awareness, attitude, and practice of sunscreen use among Saudi population for the time being. As the results showed, majority of the participants have a good knowledge about the danger of UV light exposure as reported in previous literature that was done in AL Qassim and Jeddah, Saudi Arabia (Al Robaee, 2010; Almuqati et al., 2019). Approximately half of the participants have a good knowledge when it comes to sun protective measures and the importance of sunscreen use. Many factors affect the results in a way that, younger individuals, females, singles, indoor workers and individuals with higher educational level have a better knowledge. That's similar to other studies held previously in Saudi Arabia (Al Robaee, 2010; Almuqati et al., 2019) and Jordan (Al-Qarqaz et al., 2020). Due to the fact that a lot of women are using sunscreen mainly for hyperpigmentation and cosmetic reasons, it has the reputation of being a cosmetic product. This is probably why males have much less knowledge about it. Putting into consideration that, it is more likely that men work outdoor while women are indoor, this may explain why the revealed that, indoor workers have better knowledge. This illustrates the need for intensive campaigns to increase the awareness in Saudi community and to correct the misconceptions about sunscreen as the study also illustrated that a significant percentage think that it is not necessary to use it on cloudy days and it is harmful to vitamin D level in the body. This can be achieved by explaining the importance of its use for both genders to protect from the probable hazards and to weigh the advantages and disadvantages of sunscreen use.

The current study reported that 54.8% of the participants are using sunscreen which is close to the result in Jordanian study (Al-Qarqaz et al., 2020) and contrary to Alrabiae and Al Jasser studies, in which 8.3% and 35% of participants use the Sunscreen respectively (Al Robaee, 2010; Al Jasser et al., 2020). The current study scored better results than the previous ones, which manifest that, our population is enlightened thanks to the efforts taken by health organizations and campaigns. In regard to the adequacy of its use, it is worth mentioning that 61% does not know the meaning of SPF and of PA value, and only 31.8% choose the product according to SPF. Moreover, 76.1% of participants apply sunscreen only once daily. When it comes to the timing of application, more than half of participants applied it less than 10 minutes prior to stepping out; all of this information indicates inadequate use of sunscreen as reported by other studies (Al-Qarqaz et al., 2020; Al Jasser et al., 2020). This indicates the need to explain the adequate method of using the sunscreen and the importance of following the instructions to obtain the benefits from its use otherwise it has a much less worth.

Furthermore, 43.3% never used sunscreen, which along with the inadequacy of use and the factors affecting the level of knowledge clarify the strong need for awareness campaigns. This research helps the health organizations in relation to who needs more effort to explain the importance of sunscreen use and its instructions among older age, males, and individuals with low education.

#### 5. CONCLUSION

In the current study, approximately half of the participants have good knowledge regarding to sun protective measures and the importance of sunscreen use. Factors linked with greater sunscreen use included younger age, female gender, being single, indoor workplace, and higher education level. The most used methods for skin protection among participants were seeking shade and sunscreen respectively. The most common reason for using sunscreen was to prevent development of dark skin spots, followed by to keep skin color light. For this reason, sunscreen has the reputation of being a cosmetic product and it may be the reason why males have much less knowledge about sunscreen and since men are more likely to work outdoors while women indoor, this may explain why indoor workers have a better knowledge. The study has also identified several areas of inadequate use of sunscreen. Also, the study illustrated that a significant percentage think that it is not necessary to use it on cloudy days and that it is harmful to vitamin D level in the body. As a result, increasing the perception of sunscreen use in our country might be needed. That can be achieved by explaining the importance of its use for both genders to protect from the harmful effects of sun exposure. Besides, the inadequacy of sunscreen use needs more clear explanation about the adequate method of using the sunscreen and to emphasize on the importance of that to get the benefit of using the sunscreen. Social media, TV, awareness campaigns, clinics, and pharmacists may help in accomplishing these goals and increase awareness of sun protection and adequate use of sunscreen. Moreover, prospective studies may be needed to specify the importance of another convenient and suitable method to Saudi population such as appropriate types of UV-blocking textile materials. Finally, to improve the suitable use of sunscreen, a printed sheet with all needed information including a guide on amount estimation (eg, teaspoon or fingertip), meaning of SPF and of PA value, how many times to be supportive.

**Acknowledgement**

This article would not have been possible without the great support of our supervisor, Dr. Dalal Alsaadoun. Her enthusiasm, knowledge and exacting attention to detail have been an inspiration and kept our work on track from the first step to the final draft of this paper. We would also like to thank participants all over Saudi Arabia who have agreed to participate in this study by answering the questionnaire.

**Author contributions**

Our supervisor was Dr. Dalal as she participated in the supervision and analysis of the manuscript. Zahraa was involved in the concept and design of the study, was active in the data collection process, and wrote the manuscript, which contributed significantly to the work in a timely and meticulous manner. Hawraa, Bayan, Maram and Sara actively participated in the data collection process and wrote the manuscript, contributing significantly to the work in a timely and meticulous manner. All authors drafted, reviewed, and approved the final manuscript.

**Ethical approval**

The study was approved by Almoosa Academic Affairs (IRB log No: ARC-21.08.04).

**Funding**

This study has not received any external funding.

**Conflicts of interest**

The authors declare that there are no conflicts of interests.

**Data and materials availability**

All data associated with this study are present in the paper.

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